## THE LAW OF SIZE-WEIGHT SUGGESTION.

IN 1893 Dr. J. Allen Gilbert, working under my direction, obtained measurements on the size-weight illusion. A cylindrical block of 82 mm. diameter and of 55 g. weight was compared with a series of blocks of 35 mm. diameter but of various weights. The subject first lifted the large block, and then picked out, by lifting, that block of the series which appeared to be equal in weight to the larger one. The error in weight thus made was due to the suggestive effect of the difference in size.

These were the first measurements made on the size-weight illusion ('Studies from the Yale Psychological Laboratory,' 1894, II., 43).*

The problem was then investigated in detail by Dr. C. E. Seashore ('Studies from the Yale Psychological Laboratory,' 1895, III., 1). Two sets of cylindrical blocks were made. Set $A$ varied in diameter, but had a uniform weight of 80 grams. Set $B$ varied in weight, but were of a uniform size of 43 mm. The subject, lifting the block between thumb and finger, was requested to select for each block in $A$ a block of equal weight in $B$. In this way the effect of size on apparent weight was determined.

In the 'Studies' for 1894 I had already pointed out the possibility of establishing the law of suggestion in such experiments. I now find it possible to do so on the basis of Dr. Seashore's work.

The curve conforms closely to the form $y = \frac{k}{x}$

which is the equation of a hyperbola referred to its asymptotes as axes with the constant $k$ depending on the nature of the experiment. The actual measurements differ from the values required for this formula only by a small quantity $z = f(x)$, which expresses the apparent increase in the diameter of the block due to the contrast with the constant length.*

If the blocks of the $B$ series be made of the constant diameter $c$ and those of the $A$ series of the constant weight $d$, and if we denote by $s$ the difference in size acting as a suggestion, by $i$ the resulting illusion and by $k$ a constant depending on the nature of the experiment, then we have the general law

$$i = \frac{k}{s + c} - d,$$

which can be called the law of size-weight suggestion. Thus, in the first set of experiments $c$ was 43 mm., $d$ was 80 g., and $k$ was determined by the facts: that the blocks were looked at while lifted; that the subjects were ignorant of the illusion, etc. In the other sets of experiments by Dr. Seashore $k$ took other values.

E. W. SCRIPTURE.

YALE UNIVERSITY,

January 1, 1897.

* Professor Binet has called attention to the fact that he anticipated Gilbert by one month in measuring suggestion by his experiments on the length of lines. This, however, was quite a different form of suggestion. If the question is to be raised as to the first measurements of suggestion in any form, I am justified in claiming priority over Binet by the experiments briefly indicated in the *Educational Review*, 1893, V., 61.

* The exact values of $z$ have not yet been determined experimentally. The results of a special investigation will appear in the 'Studies from the Yale Psychological Laboratory.'

## SCIENTIFIC LITERATURE.

*Round the Year: A Series of Short Nature-Studies.* PROFESSOR L. C. MIALL, F. R. S. Pp. 290. Macmillan & Co. Price, $1.50.

The book is precisely what its title promises. Its author is a cultivated and observant scholar who loves nature and records her various phases after the manner of the old-time naturalist, though rectified by new-time science. It reminds one of White's Natural History of Selborne, and the author's familiarity with that classic has unconsciously led him into the amiable and homelike style of White, and this is to the merit of the book. He evidently has little sympathy for much that goes for modern natural history to-day. He says "natural history is being choked by unassimilated facts mechanically compiled by men who have apparently ceased to think about Nature. Hence a profuse and growing literature of the most melancholy description, dry, marrowless, useless. We record and record till our catalogues grow too voluminous for storage and too stodgy for the toughest appetite." The subjects discussed cover a wide range; we are led from Insects

and Plants in Mid-winter to Snow Flakes, Birds in Mid-winter, Animals with and without Combs, The Moon, the Oil Beetle, Buds, Dutch-weed, Flower-Haunting Insects and twenty-seven other equally diversified subjects. It is interesting to learn that "Jenner, the discoverer of vaccination, was accomplished in music, and studied natural history with diligence and success." He it was who made most valuable contributions on the habits of the cuckoo, the hibernation of the Hedge-Hog, and other subjects.

A curious mistatement is made on p. 53, where the author speaks of the pearl-forming Avicula as the shell which the Chinese utilize in making artificial pearl images. Any local shell collector would have told him that it was Hyria, a fresh water mussel, and not the marine Avicula, which the Chinese use for this purpose.

The illustrations are well chosen and clearly drawn. For teachers of elementary science and as a reading book for the higher grammar and even High Schools it may well be commended. E. S. Morse.

*Researches on Mimicry on the basis of a Natural Classification of the Papilionidæ.* By Dr. Erich Haase; translated by C. M. Child, Ph. D. 1896. Pp. 154, plates 8, colored, 4to. Nägele, Stuttgart.

It should interest entomologists, and general zoologists also, to know that an English translation of a part of Dr. Erich Haase's elaborate study of mimicry among the Papilionidæ has been published. The results of Dr. Haase's researches were originally published in two parts in Leuckart and Chun's Bibliotheca Zoologica.

The portion issued in English translation is Part II. of the study, and makes a quarto volume of one hundred and fifty pages with eight colored plates. The translator, Dr. C. M. Child, now of the University of Chicago, undertook his work at the suggestion of Dr. Leuckart, of the University of Leipzig, and has made a conscientious and idiomatic translation of this important contribution to the knowledge of mimicry. Dr. Child, though not a professed special student of insects, is known to entomologists through his excellent study of Johnston's antennal organ of hearing.

So much of our knowledge of mimicry has come through the study of the mimetic phenomena exhibited among insects, and especially among the butterflies, that it was to be expected that the first serious attempt to combine a study of phylogeny with a study of mimicry should have butterflies for its subject. Systematists have certainly not yet taken much into account the influence of mimicry in making forms of wide phyletic divergence superficially alike, or in making closely related forms superficially dissimilar. Yet mimicry produces exactly these conditions; and where so many members of a group, as Dr. Haase shows is true of the butterflies, owe the chief features of their habitus to the influence of mimicry, systematists have got to take this matter into account. And this will be good for us, for it will hold up very plainly to us one of the most interesting and instructive phases of the biological study of organisms. It may broaden some of us; it can narrow no one of us.

As much for its suggestiveness as for its light on the origin and development of mimetic coloration among the butterflies, entomologists should become acquainted with Dr. Haase's work. Vernon L. Kellogg.

Stanford University,
California.

## *SCIENTIFIC JOURNALS.*

### AMERICAN JOURNAL OF SCIENCE.

The February number opens with an article by C. E. Beecher, giving an 'outline of a natural classification of the trilobites.' This is the opening portion of a memoir which will be completed in the numbers immediately following. The author's extended study of this group has enabled him to reach definite conclusions, not only in regard to the position that the trilobites properly occupy as a group of the Crustacea, but also to give a systematic and minute classification of the families and genera. The subject is too special to allow of being developed here, but attention may be called to the plate in which certain typical forms are taken to show the principles adopted as the basis of classification.